

U.S. Serial No. 10/808,691  
Response filed October 26, 2007 to  
Non-final Office Action mailed September 11, 2007

**AMENDMENTS TO THE CLAIMS**

1. (Currently Amended) A method of plasma-enhanced cleaning of a batch-type processing system, the method comprising performing a cleaning process, including:

introducing a cleaning gas in a process chamber of the batch-type processing system, the process chamber enclosing a process tube that surrounds a substrate holder adapted to hold a plurality of wafers in a vertical stack, and the process chamber having a material deposit on at least one surface therein;

forming a plasma by applying RF power to a system component within the process chamber, the system component selected from the group consisting of: the substrate holder, a substrate holder support for supporting the substrate holder, and the process tube;

exposing the material deposit in the process chamber to the plasma to form a volatile reaction product; and

exhausting the reaction product from the process chamber.

2. (Previously Presented) The method according to claim 1 further comprising monitoring a signal from the processing system, the signal being indicative of the progress of the cleaning process, and based upon the signal, performing one of the following: (a) continue performing the cleaning process and continue monitoring; or (b) stopping the cleaning process.

3. (Original) The method according to claim 2 wherein the monitoring further comprises determining if an intensity level of the signal has reached a threshold value.

4. (Original) The method according to claim 3, wherein performing (b) occurs after determining that the threshold value has been reached.

5. (Original) The method according to claim 2, wherein the monitoring comprises using an optical monitoring system to detect light emission or light absorption of a gas in the process chamber.

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6. (Withdrawn) The method according to claim 2, wherein the monitoring comprises using an optical monitoring system to detect interaction of light with at least one of the system component or the material deposit.

7. (Withdrawn) The method according to claim 2, wherein the monitoring comprises using a mass sensor to detect a mass signal of a gas in the process chamber.

8. (Previously Presented) The method according to claim 1, wherein the introducing further comprises flowing at least one of  $\text{ClF}_3$ , HF, HCl,  $\text{F}_2$ ,  $\text{NF}_3$ , or  $\text{CF}_4$  into the process chamber.

9. (Previously Presented) The method according to claim 8, wherein the introducing further comprises flowing at least one Ar, He, Ne, Kr, Xe, or  $\text{N}_2$ .

10. (Currently Amended) A method of plasma-enhanced cleaning of a batch-type processing system, the method comprising:

performing a cleaning process, including:

introducing a cleaning gas in a process chamber of the batch-type processing system, the process chamber enclosing a process tube that surrounds a substrate holder adapted to hold a plurality of wafers in a vertical stack, and the process chamber having a material deposit on at least one surface therein,

forming a plasma by applying RF power to the process tube,

exposing the material deposit in the process chamber to the plasma to form a volatile reaction product, and

exhausting the reaction product from the process chamber;

monitoring a signal from the processing system, the signal being indicative of the progress of the cleaning process; and

based upon the signal, performing one of the following:

(a) continue performing the cleaning process and continue monitoring; or (b) stopping the cleaning process.

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11. (Original) The method according to claim 10 wherein the monitoring further comprises determining if an intensity level of the signal has reached a threshold value.

12. (Original) The method according to claim 11, wherein performing (b) occurs after determining that the threshold value has been reached.

13. (Original) The method according to claim 10, wherein the monitoring comprises using an optical monitoring system to detect light emission or light absorption of a gas in the process chamber.

14. (Withdrawn) The method according to claim 10, wherein the monitoring comprises using an optical monitoring system to detect interaction of light with at least one of the system component or the material deposit.

15. (Withdrawn) The method according to claim 10, wherein the monitoring comprises using a mass sensor to detect a mass signal of a gas in the process chamber.

16. (Previously Presented) The method according to claim 10, wherein the introducing further comprises flowing at least one of  $\text{ClF}_3$ , HF, HCl,  $\text{F}_2$ ,  $\text{NF}_3$ , or  $\text{CF}_4$  into the process chamber.

17. (Previously Presented) The method according to claim 16, wherein the introducing further comprises flowing at least one Ar, He, Ne, Kr, Xe, or  $\text{N}_2$ .

18. (Withdrawn-Currently Amended) A batch-type processing system, comprising:

a process chamber enclosing a process tube that surrounds a substrate holder adapted to hold a plurality of wafers in a vertical stack, and the process chamber containing a material deposit on at least one surface therein;

an electrode that is a system component within the process chamber and that is selected from the group consisting of: the substrate holder, a substrate holder support for supporting the substrate holder, or the process tube;

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a gas injection system configured for introducing a cleaning gas in the process chamber;

a plasma source configured for forming plasma in the process chamber by applying RF power to the electrode, wherein the plasma is capable of reacting with the material deposit to form a volatile reaction product;

a vacuum pumping system configured for exhausting the reaction product from the process chamber; and

a controller configured to control the processing system.

19. (Withdrawn) The processing system according to claim 18, further comprising a chamber monitoring system configured for monitoring a signal from the processing system to determine cleaning status of the processing system and configured to transmit the status to the controller, and wherein the controller is further configured to receive the status and to control the processing system in response to the status.

20. (Withdrawn) The processing system according to claim 19, wherein the chamber monitoring system is further configured to determine if an intensity level of the signal has reached a threshold value, and based on the determination, either continue with the process or stop the process.

21. (Withdrawn) The processing system according to claim 19, wherein the chamber monitoring system comprises an optical monitoring system to detect light emission or light absorption of a gas in the process chamber.

22. (Withdrawn) The processing system according to claim 19, wherein the chamber monitoring system comprises an optical monitoring system to detect interaction of light with at least one of the system component or the material deposit.

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23. (Withdrawn) The processing system according to claim 19, wherein the chamber monitoring system comprises a mass sensor to detect a mass signal in the process chamber.

24. (Withdrawn) The processing system according to claim 18, wherein the electrode is the process tube and the plasma source comprises a RF generator and a match network coupled to the process tube.

25-27. Canceled

28. (Withdrawn) The processing system according to claim 18, wherein the system component comprises at least one of quartz,  $\text{Al}_2\text{O}_3$ , SiN, SiC, doped silicon, SiC-coated graphite, or Si-coated graphite.

29. (Withdrawn) The processing system according to claim 18, wherein the material deposit comprises at least one of Si, SiGe, SiN,  $\text{SiO}_2$ , doped Si,  $\text{HfO}_2$ ,  $\text{HfSiO}_x$ ,  $\text{ZrO}_2$ , or  $\text{ZrSiO}_x$ .

30-31. Canceled

32. (Withdrawn-Currently Amended) A batch-type processing system, comprising:

- a process chamber enclosing a process tube that surrounds a substrate holder adapted to hold a plurality of wafers in a vertical stack, and the process chamber containing a material deposit on at least one surface therein;

- a gas injection system configured for introducing a cleaning gas in the process chamber;

- a plasma source configured for forming plasma in the process chamber by applying RF power to the process tube, wherein the plasma is capable of reacting with the material deposit to form a volatile reaction product;

- a vacuum pumping system configured for exhausting the reaction product from the process chamber;

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a chamber monitoring system configured for monitoring a signal from the processing system to determine cleaning status of the processing system and to transmit the status; and

a controller configured to receive the status from the chamber monitoring system and to control the processing system in response to the status.

33. (Withdrawn) The processing system according to claim 32, wherein the chamber monitoring system is further configured to determine if an intensity level of the signal has reached a threshold value, and based on the determination, either continue with the process or stop the process.

34. (Withdrawn) The processing system according to claim 32, wherein the chamber monitoring system comprises an optical monitoring system to detect light emission or light absorption of a gas in the process chamber.

35. (Withdrawn) The processing system according to claim 32, wherein the chamber monitoring system comprises an optical monitoring system to detect interaction of light with at least one of the process tube or the material deposit.

36. (Withdrawn) The processing system according to claim 32, wherein the chamber monitoring system comprises a mass sensor to detect a mass signal in the process chamber.

37. (Withdrawn) The processing system according to claim 32, wherein the plasma source comprises a RF generator and a match network coupled to the process tube.

38-41. Canceled

42. (Withdrawn) The processing system according to claim 32, wherein the system component comprises at least one of quartz or SiC.

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43. (Withdrawn) The processing system according to claim 32, wherein the material deposit comprises at least one of Si, SiGe, SiN, SiO<sub>2</sub>, doped Si, HfO<sub>2</sub>, HfSiO<sub>x</sub>, ZrO<sub>2</sub>, or ZrSiO<sub>x</sub>.

44-45. Canceled